

FRANCISCO ARCEO DE FREGENAL AND THE TREATMENT OF CLUBFOOT UP TO THE SIXTEENTH CENTURY

FRANCISCO ARCEO DE FREGENAL I LIJEČENJE PRIROĐENOG UVRNUTOG STOPALA DO 16. STOLJEĆA

José Ramón Vallejo, Marina Mesa, José Miguel Cobos-Bueno*

SUMMARY

The correction of clubfoot as a subject of study is somewhat unusual, especially if one considers that up until the Renaissance only two authors dealt with the subject of this inherited disorder. On the one hand is Ambroise Paré, whose contributions to traumatology and orthopaedics are staggering, and on the other, Francisco Arceo de Fregenal, also known as the Ambroise Paré of Spain. Both men developed a method for treating this condition, and a special orthopaedic shoe. So, why is it that in the Spanish literature the French surgeon was considered the pioneer in the development of an orthopaedic boot from the start and not Arceo? Why was the work of the Spaniard not studied in depth, as it deserves to be? These questions troubled us and led us to write this paper, in which as the primary objective we decided to highlight Arceo's contributions to the field of orthopaedics. Concrete arguments and works exist today that have led to common agreement among scholars of the subject that the Spanish surgeon was a Jewish convert. The social, economic and political conditions in Europe at that time may give us some idea of the difficulties for a Jewish convert in the sixteenth century, and clearly, it was difficult for a scientist to have followers who would defend

* Departamento de Terapéutica Médico-Quirúrgica, Facultad de Medicina, Universidad de Extremadura, Badajoz, Spain.

Correspondence address: José Ramón Vallejo, Área de Didáctica de las Ciencias Experimentales, Equipo de Historia de la Ciencia y Antropología de la Salud, Facultad de Educación, Universidad de Extremadura. Avda. de Elvas s/n. 06006 Badajoz, Spain. E-mail: joseramonvallejo@unex.es.

his methods and technical ideas. Nevertheless, we believe that Francisco Arceo de Fregenal deserves more recognition and his work should continue to be studied in more depth.

Keywords: History of orthopaedics, clubfoot, Renaissance, Ambroise Paré, Arceo

INTRODUCTION

Although in most dictionaries the word “orthopaedics” is said to derive from *orthos* (straight) and *paideia* (education), in the sense of the art of correcting or avoiding deformation of the human body, its origin is in fact rather different. The French doctor Nicolas Andry coined the term *orthopédie* in 1741. For this author the word *paideia* had the original Greek meaning “of children or relating to children”, rather than the modern meaning of “education”. This is how Andry explained the origin of his neologism:

“[...] I formed it from two Greek words: from orthos, which means straight, not deformed, correct, and from paidon, which means child. From these two words I constructed the word orthopaedics, to express a single term; my plan is to teach various methods for the prevention and correction in children of deformities of the body”¹.

This author used the image of a twisted tree which, in order to correct its growth, is tied firmly to a stake, to symbolise this branch of medicine².

Orthopaedic Surgery, like many other specialities, has developed on the basis of necessity. The necessity to correct deformities, restore function and relieve pain. Orthopaedic surgeons have developed the ability to prevent a substantial loss of bodily function and in some cases they can avoid the death of a patient. They seek perfection in their art, to ensure that the patient reaches optimal condition in the shortest time possible by using the safest method available. However, it has taken many centuries to reach this point, to learn from the certainties and, more especially, from the errors of the past.

Since the beginning of time, people have struggled to survive, hence the need to confront any adversities that encounter. Palaeopathology has revealed the existence of fracture calluses, bone tumours and skeletal

¹ The original text states: “[...] je l’ai formé de deux mots grecs, sçavoir, d’*Orthos* qui veut dire droit, exempt de difformité, qui est selon la rectitude, & de *Paidon*, qui signifie *Enfant*. J’ai composé de ces deux mots, celui d’*Orthopédie*, pour exprimer en un seul terme, le dessein que je me propose, qui est d’enseigner divers moyens de prévenir & de corriger dans les enfants, les difformités du corps” Andry, N. *L’orthopédie ou l’art de prévenir et de corriger dans les enfants, les difformités du corps* (Paris: Rue Saint Jacques, 1741-1743), vol. 1, ij. Available from: <https://books.google.es/books?id=oKMUAAAQAAJ&printsec=frontcover&hl=es#v=onepage&q&f=false> [consulted 11/11/2015].

² *Ibid.*, 282.

malformations such as clubfoot or syndactyly since ancient times, in pre-historic sites in both Europe and Africa. It is therefore inevitable that at some point a prehistoric man created a splint to alleviate anatomical problems, and it is also very likely that he or she was a pioneer in performing amputations or using therapeutic ointments. These methods were part of the rites and beliefs about death and illness, since a combination of empirical elements and magic are typical of this primitive form of medicine.

If we look at ancient Egypt, mummified bodies, paintings, murals and hieroglyphics have been found which show that the Egyptians suffered from as many complaints as we do today. We can also see orthopaedic practices such as splints depicted on mummies, made from bamboo, cane or wood. Moreover, texts using crutches are shown in an engraving from the year 2830 BC.

However, it is the ancient Greeks who can be considered the first people to take a scientific view of the world, and so Homer (800 BC), in his tale of the Trojan War, tells us of the injuries of those times and their treatment. The *Iliad* also contains references to various musculoskeletal deformities. Hippocrates (460-370 BC) also deals with these problems in his works, and from among these we can cite “On the Articulations” - *peri arthron*-, “On Fractures” -*peri agmon*- and “On the Instruments of Reduction”-*mokhlikós*- as significant examples. Thus, in the book “On Fractures” he introduced techniques for continuous traction, immobilisation using splints, and progressive compression using bandages which allow for extension and counter-extension of the limbs. His works also include notes on paediatric orthopaedics (he describes the correction of clubfoot, amongst other things). The first description of clubfoot (*talipes equinovarus*, *supinatus* or *adductus*) was made by Hippocrates more than 2,000 years ago and he made the first attempt at a treatment by manipulation. In order to maintain the correction obtained, he applied a strong bandage. He was later able to state that most cases of clubfoot could be corrected by manoeuvring and that this should be performed as soon as possible. He also called clubfoot “*killopodie*” and he treated it with a leather boot with a lead sole. However, neither the boot, nor its design or construction has appeared to date in any source.

It was during the Graeco-Roman period that people started to design and produce prostheses to replace amputated limbs. The oldest reference to amputation is from the Greek historian Herodotus (484-425 BC).

In the Middle Ages, Galen's concept of "laudable pus" prevailed, i.e. the quest for a substance that would make it possible to destroy any infection and induce healing. So, German "healers" gave massages, reduced dislocations and fractures, and healed wounds. Guy de Chauliac (1290-1368) is another great mediaeval surgeon, from the Montpellier school, who introduced a novel contribution to the field of traumatology and orthopaedics: the use of continuous traction, using weights and pulleys to reduce and treat femoral fractures. Guglielmo de Saliceto (1210-1278) wrote his principal work, "La Chirurgia" ["Surgery"], divided into six books, which included one dedicated to fractures and dislocations, another to wounds and bruising, and yet another to anatomy. Finally, there was Lanfranco de Milán (1240-1306), who used complicated winding of bandages and strips on to which a solid plaster was applied.

The social, economic and political conditions in Europe led to internal developments in this field which ended in the fifteenth century in the Renaissance. Leonardo da Vinci (1452-1519) was crucial in the development of western culture. Paracelsus (1493-1541) chose to intervene as little as possible when treating wounds, fractures and dislocations, and the Flemish Andreas Vesalius was without doubt the greatest anatomist of all time. However, the most outstanding surgeon of the sixteenth century was the Frenchman Ambroise Paré (1510-1590). Paré's contributions to traumatology and orthopaedics are staggering. He was the first to describe femoral neck fracture and epiphyseal detachment in children. In addition, he designed a great variety of forceps, instruments and splints of all kinds. With the help of weapons manufacturers, he designed artificial limbs from iron, refined the Hippocratic bench to reduce dislocations, and designed a corset for scoliosis and a boot for clubfoot.

A historical analysis of the descriptions of club foot is quite complex and at times an orthopaedic problem is involved that is difficult to determine³. Currently, the identification of clubfoot is performed using a diagnosis of exclusion, and so it is necessary to find a cause before defining it. Nevertheless, the aetiology of clubfoot and its true cause are unknown, since there is uncertainty about both the pathogenesis and the internal mechanisms that

³ See Parker, R.W. and Shattock, S.G. 'The pathology and etiology of congenital club-foot', *Trans Path Soc Lond*, 35 (1984), 423-444; Strach, E.H. 'Club-foot Trough the Centuries', in Rickham, Peter Paul (ed.), *Historical Aspects of Pediatric Surgery*, 20, series Progress in Pediatric Surgery (Berlin, Heidelberg: Springer-Verlag, 1986), 215-237 and Carroll, Norris. 'Clubfoot Trough the Ages', in Raffensperger, John G. (ed.), *Children's Surgery: A Worldwide History* (North Carolina: McFarland, 2012), 160-166.

lead to the deformity⁴. Three theories seeking an explanation now exist: a) the postural theory, or extrinsic compression by positional anomaly; b) the neuromuscular theory, which considers the existence of a pathological process which alters the muscle to cause surrounding fibrosis; and c) the malformation theory, which proposes an abnormal conformation of the talus, especially of its neck and head, i.e. total subluxation of the talus, calcaneus and navicular bones⁵. Yet we must not forget the ideas of Carl Hueter (1838–1882) and Richard von Volkmann (1830–1889) on the inhibitory effect of pressure on growth and ossification⁶ that were revived by Bohm in 1929 to explain the aetiology of clubfoot and were the subject of discussion⁷. An environmental aetiology due to teratogenic agents was also suggested, and even a hereditary explanation⁸.

Retrospectively, it is interesting to consider Antonio Scarpa (1752–1832). Scarpa and Paré agreed with Hippocrates that the cause of the deformity was postural, mechanical pressure in the uterus⁹. Above all, because this theory was revived in 1884 by Parker and Shattock¹⁰, who believed with other authors that the foetal feet are inverted and that the increased pressure could lead to muscle damage and deformity¹¹. Antonio Scarpa can be seen as the key figure on this matter, because his observations led him to think of an

⁴ Nordin, S. *et al.* 'Controversy in congenital clubfoot: Literature Review', *Malaysian Journal of Medical Sciences*, 9, 1 (2002), 34-40; Dimeglio, A. and Canavese, F. 'The Clubfoot: An Overview of Current Procedures', *Rev Ortop Traumatol*, 50 (2006), 156-63 and Kelly, D.M. 'Congenital anomalies of the lower extremity, in Canale S.T., Beaty J.H. (eds.), *Campbell's Operative Orthopaedics*, 12th edn (Philadelphia, PA: Elsevier Mosby, 2013).

⁵ *Ibid.*, 156-63 and Álvarez, C., *et al.* 'Review of Current Methods Used in the Treatment of Clubfoot at Initial. Presentation and at Recurrence', *Journal of Surgical Orthopaedic Advances*, 17, 2 (2008), 107-114.

⁶ Mehlman, C.T., Araghi, A. and Roy, D.R. 'Hyphenated history: the Hueter-Volkmann law', *Am J Orthop (Belle Mead NJ)*, 26 (1997), 798-800; Willy, C. *et al.* 'Richard von Volkmann: surgeon and Renaissance man', *Clinical Orthopaedics and Related Research*, 466, 2 (2008), 500-6; Gamboa Márquez, Alejandro and Garzón-Alvarado, Diego Alexander. 'Factores mecánicos en enfermedades osteocondrales', *Rev Cubana Invest Bioméd*, 30, 1 (2011), 171-192 and Hernigou, P. 'Authorities and foundation of the orthopaedic school in Germany in the 19th century: part II: Richard von Volkmann, Julius Wolff, Albert Hoffa, Friedrich Trendelenburg and other German authors', *International Orthopaedics (SICOT)*, 40, 4 (2016), 843-53.

⁷ Bohm M. 'Embryologic origin of clubfoot', *J Bone Joint Surg*, 11 (1929), 229–59 and Gruber, H. *et al.* 'The different growth zones of the fetal foot', *Ann Anat*, 183, 3 (2001), 267-273.

⁸ Nordin *et al.*, *op. cit.*

⁹ Adams, Francis. *The Genuine Works of Hippocrates Translated from the Greek*, (Sydenham Society, 1849), 1; Carroll, *op. cit.* and Nordin *et al.*, *op. cit.*

¹⁰ Parker and Shattock, *op. cit.* and Hjelmstedt, A. and Sahlstedt, B. 'Talar deformity in congenital clubfeet. An anatomical and functional study with special reference to the ankle joint mobility' *Acta Orthop Scand*, 45, 4 (1974), 628-640.

¹¹ Carroll, *op. cit.*

alteration in the tissues that caused the dislocation, and he designed an orthosis¹². During the 19th century both conservative and surgical techniques were used, as well as manual corrections, braces or gradual stretching, and tenotomy was performed. It should be noted that, with the arrival of anaesthesia (1846) and Lister's antiseptic methods (1862), the surgery became more aggressive, to the extent of bone surgery such as astragalectomy, or removal of the talus bone, in the last third of the nineteenth century. However, the appearance of plaster was a major boost for conservative treatments in this century. Throughout the twentieth century, most orthopaedic surgeons were in agreement with the Hippocratic idea of starting treatment as soon as possible after birth. Yet at first, severe corrective measures such as those used in the previous century were favoured. The use of a splint was also popular, following strong corrective measures, or other treatments involving repeated gentle manipulation and the use of serial plaster casts; in addition, subcutaneous tenotomy was performed on the Achilles tendon, and together with conservative techniques such as the Ponseti method, more aggressive surgery was performed in many centres¹³. However, nowadays surgical treatment is only used when orthopaedic treatment does not produce any improvement and is ineffective. There is also full consensus that immediate and urgent rehabilitation is essential. The conservative treatments used these days are varied, but they all share the same fundamental objectives as in earlier times. Basically, functional rehabilitation and manipulations with splints or serial casts are used now. The results of any treatment depend on the severity of the deformity, the philosophy of the surgeon regarding the deformity, the experience in rehabilitation and manipulation, and the daily effort regarding treatment that usually lasts more than a year. Finally, we would emphasise the philosophies contained in the methods such as the Ponseti technique in which it is better to retain some residual deformity in a mobile foot than have a foot that is stiff and painful even if totally corrected¹⁴. The advance in all these factors, *taking into account the historical context, marks the differences compared with the conservative methods of the past.*

Correction of clubfoot has not been a subject much studied in the course of human existence, and moreover, until the Renaissance only a couple of authors dealt with the subject of this inherited disorder. These were the above-mentioned Ambroise Paré and Francisco Arceo de Fregenal, who

¹² Scarpa, A. *A Memoir on the Congenital Clubfoot of Children and the Mode of Correcting that Deformity* (Edinburgh: Constable, 1818).

¹³ Carroll, *op. cit.*

¹⁴ Dimeglio and Canavese, *op. cit.* and Álvarez, *op. cit.*

developed both a method for treating this condition and a special orthopaedic shoe. In spite of all this, it is astonishing to find that in the Spanish literature Ambroise Paré appears as the pioneer in designing an orthopaedic boot, leaving Francisco Arceo completely out of the picture: even though he was Spanish, his compatriots have never accorded him sufficient recognition. While it is true that for some time now the work and figure of Francisco de Arceo have been studied in depth by Spanish scientists¹⁵, for the international community he continues to be a little-known figure and is given only superficial treatment. While it is true that some publications can be found that summarise his work¹⁶ or describe and analyse some relevant aspect of it¹⁷, this is insufficient, given the calibre of the man. Our interest in him has led us to establish the importance of his work in numerous fields, and one of these is orthopaedics. In this respect, we have observed that in the international context the general literature dealing with the history of orthopaedics does not usually include Francisco de Arceo¹⁸, although brief mentions can be found of his orthopaedic methods and practice, basically citing the use of iron in splints, followed by a special shoe to treat clubfoot¹⁹. Consequently, we set as our primary objective in this paper to highlight his contributions to the field of orthopaedics, and to help make his exceptional work more widely known internationally. For this, we will start from the contributions of Ambroise Paré, then, after a brief biography of Arceo, we will set out in detail the treatment for clubfoot that appears in his book, and highlight a

¹⁵ See Oyola Fabián, A. and Cobos Bueno, J. M. *Método verdadero de curar las heridas y otros preceptos de este arte. Método de curar las fiebres. Francisco Arceo de Fregenal. Prefacio de Benito Arias Montano* (Huelva: Servicio de Publicaciones de la Universidad de Huelva, Biblioteca Montaniana, 2009); Cobos Bueno, J. M., Oyola Fabián, A. and García Ávila, J.F. 'El Bálsamo de Francisco Arceo de Fregenal', *Llull*, 33, 72 (2010), 241-268; Montero Cartelle, E. 'Benito Arias Montano y Francisco Arceo: la redacción del De recta curandorum vulnerum ratione' *Asclepio, Revista de Historia de la Medicina y de la Ciencia*, LXIV, 2 (2012), 417-434; Cobos, J.M. and Vallejo, J.R. *Francisco Arceo, médico del Sant Oficio de la Inquisición de Llerena*, in XV Jornadas de Historia de Llerena, 'Inquisición', Llerena, 24 and 25 October 2014 (Llerena: Sociedad Extremeña de Historia, 2015), 299-310 [see www.sociedadextremeñadehistoria.es].

¹⁶ Moulin, Daniel de *A history of surgery, with emphasis on the Netherlands*, (Dordrecht, Boston and Lancaster: Martinus Nijhoff, 1988).

¹⁷ Muñoz-Sanz, A., García-Ávila, J.F., Vallejo, J.R. 'Cases of aphasia in a work on medicine from the 16th century', *Acta Medico-Historica Adriatica*, 12, 2 (2014), 371-384.

¹⁸ Peltier, L.F. *Orthopedics: a history and iconography*, Norman Orthopedic Series 3, Norman Surgery Series 6. (San Francisco: Norman Publishing, 1993); Mostofi, S.B. (ed.), *Who's Who in Orthopedics* (Springer Science & Business Media, 2005).

¹⁹ Walsh, James J. *The Century of Columbus* (New York: Catholic Summer School Press, 1914), 421; Fixsen, J.A. *Children's orthopaedic Surgery*, in Leslie Klenerman (ed.), *The evolution of orthopaedic surgery* (London: Royal Society of Medicine Press, 2002), 153; Hefti, F. *Pediatric Orthopedics in Practice* (Berlin Heidelberg, Springer-Verlag, 2015), 426.

plagiarism of his work. Finally, we will end with a discussion about the dissemination of his methods through history.

CONTRIBUTIONS OF AMBROISE PARÉ

Paré was born around 1510 in Bourg-Hersent, Laval, and died in Paris on 20 December 1590²⁰. He was an apprentice barber in his village. In 1532 he moved to Paris, working as a simple barber while increasing his knowledge of surgery. He was a military surgeon in the French army and to the French Kings Henri II, François II, Charles IX and Henri III. He introduced the use of ligatures on arteries (first-line treatment) to stop bleeding, rejected the practice of cauterising wounds with boiling oil and promoted the use of artificial limbs. Without any formal education, he was the first surgeon to describe his technical work in his mother tongue rather than in Latin.

In his “Livre Des Monstres et Prodiges” [“Of Monsters and Marvels”], chapter XI, Paré says:

“Sometimes it also happens by chance that the womb is naturally quite wide, but if the woman is large, from almost always being seated during pregnancy, and the sewing ladies, as seamstresses often do, or those who work away at tapestry on their knee, or if the belly is bandaged and too tight, the children are born bent, hunchbacked and deformed, some with twisted hands and feet, as you can see in this figure”²¹.

In the margin he wrote: “these children are said to have clubfoot, and club-hand”. It is accompanied by a plate showing a child with these deformities, with the following caption: “Figure of a child who was pressed against his mother’s belly, with his hands and feet twisted”, which we have reproduced below (Fig. 1).

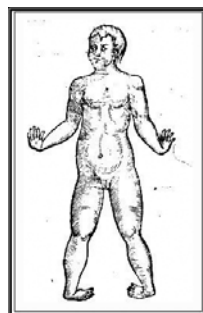
²⁰ Vincelet, L. (1968) *Ambroise Paré et la religion* Histoire des sciences médicales, 1968, 2, 79-93. Available from: <http://www.biusante.parisdescartes.fr/sfhm/hsm/HSMx1968x002x002/HSMx1968x002x002.pdf> [consulted 15/11/2015].

²¹ “Or quelquefois aussi il advient par accident que la matrice est asses ample naturellement, toutefois la femme étant grosse, pour s’être tenue quasi tousseurs assise pendant sa grossesse, et les cuises, comme volontaires, comme volontiers font les couturières, ou celles qui besognent en tapisseries sus leurs génois, ou s’être bandée, et trop serré le ventre, les enfants naissent courbé, bossus, et contrefaits, aucuns ainsi les mans et les pieds tortus, comme tu vois par ceste figure” Paré, Ambroise *Les Oeuvres d’Ambroise Paré*. Quatriesme Edition. Paris: Gabriel Buon, Avec privilege du Roy (1585), 1039. Available from: <http://www2.biusante.parisdescartes.fr/livanc/?cote=01709&do=chapitre> [consulted 28/10/2015].

Fig. 1: Original drawing published by Ambroise Paré²².

In 1575, Ambroise Paré dedicated a chapter in his work to varus and valgus feet, making a distinction between the two manifestations. We have two interpretations. In the 1840 edition, of J.-F. Malgaigne, we read:

*“It seemed to me a good idea to state that the condition is called varus in Latin, that is to say, when the foot is turned inwards... In contrast, when the foot is turned outwards in the patient who has this condition, it is called valgus”*²³.



However, in the edition of 1585, it says:

*“It seemed to me a good idea to describe a condition, in which the patient is said in Latin to be afflicted with Varus, or Valgus, that is to say, when the foot is turned outwards, the ancients called it Varus... When the foot is turned inwards, the patient is said to have Valgus”*²⁴.

Yet, in both editions, he wrote: *“... and both conditions are popularly called clubfoot: and this does not only refer to the feet, but also to the knees”*²⁵.

He sets out two causes for this malformation: on the one hand, during pregnancy with the child, and on the other, during nursing. He says:

*“... and this condition sometimes arises in the belly of the woman: during her pregnancy she sometimes sits too long with her legs crossed. Or from the poor attitude of the wet nurse towards the child, from not holding the child correctly or from having pressed and turned the foot out of its natural shape”*²⁶.

²² *Ibid.*, 1039 (taken from Paré, Ambroise).

²³ “Il m’a semblé bon d’écrire selon la disposition est nommé en latin varus, à savoir, quand le pied est tourné vers le dedans... Au contraire, quand le pied est tourné vers la partie extérieure, on nomme le patient qui a tel vice, valgus” Malgaigne, J.-F. *Oeuvres complètes d’Ambroise Paré*, volume II (Paris: Chez J.-B. Baillière, 1840-1841), 613-614. Available from: books.google.es/books?id=WOESAAAAYAAJ [consulted 11/10/2015].

²⁴ “Il m’a semblé bon d’écrire un vice, dont le patient selon la disposition est nommé en latin Varus, ou Valgus, à savoir, quand le pied est tourné vers le dehors, les anciens ont appelé le malade Varus... Or quand le pied est tourné vers la partie intérieure, on nomme le patient qui a tel vice, Valgus” Paré, *op. cit.*, 914.

²⁵ “... et l’un et l’autre vice est nommé du vulgaire pied-bot: et n’advient pas seulement au pied, mais aux genouillés pareillement” Malgaigne, *op. cit.*, 614; Paré, Ambroise *op. cit.*, 914.

²⁶ “... et ce vice vient quelquefois du ventre de la mère: laquelle pendant sa grossesse s’est tenue trop longuement assise les jambes croisées. Ou pour la mauvaise figure qu’aura tenue la nourrice envers l’enfant, pour ne l’avoir tenu bien droit, ou pour avoir pressé et tourné le pied contre sa figures naturelle” Malgaigne, *op. cit.*, 614; Paré, Ambroise *op. cit.*, 914.

His treatment was to reduce the deformity; if it was varus, to try to turn it into valgus, and vice versa. He writes:

“To cure these conditions, and reduce the bones in situ, one must push them into their natural position. And it is important to note here that if the patient’s condition is Varus, the foot must be pushed, and held as if one wished to make it Valgus. On the other hand, if it is Valgus, one must push it as if one wanted to make it Varus; and they must be held for a considerable length of time, in order for the bones to remain in their rightful position”²⁷.

For this condition, bandages and compresses would be applied and leather boots used, split at the front and under the foot, and they would be attached comfortably and a “remedy” applied. Paré wrote:

“Because they have to be pushed more, and held in place by bandages and compresses applied to the problem area, and by suitable small boots, which should be of the thickness of a teston coin, made of boiled leather and with a split at the front and underneath the foot, so that they open better when putting the foot in, and tied and attached comfortably; and when this remedy applied, it is excellent in such cases (see Fig. 2)”²⁸.

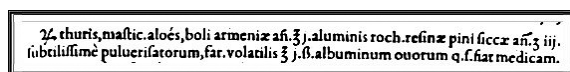


Fig. 2: Original text of the paragraph published in *Les Oeuvres d'Ambroise Paré*.

He also says that turpentine can be added so that it does not dry out too soon. He recommends that the child with valgus or varus should not be made to walk under any circumstances until the joints are fully set²⁹. However, he

²⁷ “Pour remédier à tels vices, et réduire les os en leur lieu, il les faut poulser en leur situation naturelle. Et faut ici noter, que si la malade est Varus, il faut pulser le pied, et le tenir comme si on le vouloir rendre Valgus. Au contraire, s’il est toit Valgus, le faut pulser comme si on le vouloit rendre Varus: et les y faut tenir assez long temps, à fin que les os puissent demeurer en leur deüe situation” Malgaigne, *op. cit.* 614; Paré, Ambroise *op.cit.*, 914.

²⁸ “Parquoi il faut d’avantage les poulser, et les y faut tenir tant par bandages et compresses appliquées au lieu vers lequel tend le vice, et aussi par petites bottines propres à ce faire, lesquelles seront de l’espaisseur d’un testons, faites de cuir bouilly, et fendues par le devant et soubz le pied, à fin qu’elles s’ouvrent mieux pour y mettre le pied, et seront liees et attachees commodément: et y sera appliqué ce remède, qui en tal cas est excellent (ver fig. 2)” Paré, Ambroise *op.cit.*, 914.

²⁹ See the original text: “Il faut ici noter qu’on ne doit aucunement faire cheminer les enfants Varos, et Valgos, que premierement les jointures ne foient bien affermies, de peur qu’ils ne se luxent de rechef”, Paré, *op.cit.*, 914.

makes clear that some children are born with twisted feet, a condition popularly called clubfoot, and for these he says the same remedy should be applied as for those with varus or valgus, and the boots he mentions used. He says:

*“There are also children born with twisted feet, popularly known as clubfoot: they are to be treated as those with varus or valgus: apply compresses gently, and place boots made of boiled leather (just as one handles casings for vessels of gold or silver) in order to keep the feet straight: as in the figure”*³⁰.



Fig. 3: Original drawing of Paré's boot³¹.

BIOGRAPHICAL SKETCH OF FRANCISCO ARCEO DE FREGENAL

It was the Italian-born doctor Juan Bautista Juanini (Giovanni Battista Giovannini) who, in the middle of the seventeenth century, undertook a reappraisal of this surgeon from Fregenal, considering him to be the finest in Europe in his day:

*“... many Spaniards of great learning and universal acclaim have written..., it was surprising to observe that this Court was not aware of the book written by Francisco Arceo, a native of Fregenal de la Sierra in Extremadura, entitled Francisci Arcae, de recta curandorum Vulnerum ratione. He was the finest Spanish author practising and writing about surgery in the opinion of all of Europe, and as Father Arias Montano proclaimed in the Preface with these words: “Francisci Arcae, Doctoris Medici Hispani, in omni Artis huius parte dexteritatem, ac felicitatem admirabilem, sed in Chirurgiae praeci..., atque usu obtupendam quandam praestantiam”. His work contains different remedies, or recipes invented and used by him, including one called balsam, which, in the north is used as an alternative remedy for head wounds... and among the remedies for fistula with which he treated the King of France... He finally won appreciation and esteem in far off countries, yet was forgotten, through lack of curiosity, by the Surgeons of his own land”*³².

³⁰ “Pareillement il y a des enfants qui naissent les pieds tortus, appelez vulgairement pieds bots: ils seront reduits comme les Varus et Valgus, puis liez commodément avec compresses, et posez en petites botines faites de cuir bouilli (comme lon fait estuits à mettre vaisselles d’or ou d’argent) à fin de bien tenir les pieds droits: dont tu as ici la figure”. *Ibid*.

³¹ Taken from Paré, *op.cit.*, 915.

³² “Y en prueba de lo poco que se aplican algunos a esto, sin hacerles argumentos con Autores Estrangeros, porque hay muchos españoles que han escrito con gran magisterio, y universal estimación, que omitiendo el nombrar muchos, por no dilatar el Discurso, ha extrañado el haber visto, no se conoce en esta Corte el libro que escribió Francisco Arceo,

We are not directly aware of any document that refers to our author regarding the Spanish element of his name, as he does not appear in the Fregenal sacramental record books of that time. Therefore we decided on the Latinism “Arceo”. We also considered the possibility that *Arcaeus* was the Latinised form of the surname Arcos, present in the Fregenal personal name and in particular in the family of Arias Montano³³. From now on we will call him Francisco Arceo de Fregenal, which we believe to be the most accurate translation of the name that the author used for himself at the top of his work.

He must have been born in Fregenal de la Sierra, if we consider this adjectivised place name as it appears on the cover of his work *De recta curandorum...*, which reads: *Francisco Arcaeo Fraxinalensi*. In a passage from this book he refers to Arias Montano as *our*, i.e. to a “man from my own town”³⁴.

There is a unanimous agreement that he was born in the year 1493:

*“Francisco Arceo is alive and still with us, about to turn eighty, and he practises both areas of medicine with the same skill that he possessed before he reached the age of forty”*³⁵.

natural de Fregenal de la Sierra en Estremadura, cuyo título es Francisci Arcae, de recta curandorum Vulnerum ratione. Este es el mejor Autor Español que ha practicado y escrito la Cirugía, como lo confiesa toda Europa, y lo proclamó el Padre Arias Montano en la Prefación del mismo donde dize estas palabras: Francisci Arcae, Doctoris Medici Hispani, in omni Artis huius parte dexteritatem, ac felicitatem admirabilem, sed in Chirurgiae praeci..., atque usu obtupendam quandam praestantiam. Contiene su obra diferentes remedios, o recetas que inventó y practicó por su mano y entre ellas, una que llama Bálsamo, con el qual, en la parte del Norte no usan de otro remedio para curar las heridas de Cabeça (y el Suplicante lo ha puesto en esta Corte en la Botica de Gabriel Manchini) y entre los remedios con que se curó la fistula el Rey de Francia, después de manifestada, fue el principal este Balsamo, como lo dixo el Cirujano que obró esta cura. Finalmente él se mereció el aplauso, y estimación en los Países remotos, y el olvido, de la poca curiosidad de los Cirujanos de su Patria. Parece que por los de aquel tiempo juzgava a algunos de este (aunque ha mas de cien años que murió” Juanini, J.B. Señor, el Doctor D. Juan bautista Juanini, cirujano de Camara, que fue de S.A. el Señor D. Juan de Austria... (Madrid, 1690?), fols., 14v–15. Available from: books.google.es/books?id=-13q-6Pz7h4C [consulted 01/04/2014].

³³ Oyola Fabián, A. and Cobos Bueno, J. M. *Método verdadero de curar las heridas y otros preceptos de este arte. Método de curar las fiebres. Francisco Arceo de Fregenal. Prefacio de Benito Arias Montano* (Huelva: Servicio de Publicaciones de la Universidad de Huelva, Bibliotheca Montaniana, 2009).

³⁴ Oyola Fabián, A. *El año de nacimiento de Benito Arias Montano el Mayor*, IV Jornadas de El Humanismo Extremeño (Trujillo, Badajoz: 2001), 87-94.

³⁵ “Viuit adhuc hoc tempore Franciscus Arcaeus, anunn agens fere octogesimum eademque dexteritate vtramque Medicinae partem fdacit ac si quadragesimum aetatis nondum excessisset” Arcaeo, F. *De recta curandorum vulnerum ratione et aliis eius artis praeceptis libri II ... Eiusdem De febrium curandarum ratione* (Antverpiae, Ex officina Chistophori Plantini, 1574), 10-11. Available from: <https://books.google.es/books?id=UGsnioFu2GIC> [consulted 07/01/2016].

As this is what Arias Montano wrote in 1573, in the prologue to the work *De Recta curandorum...*, it lends credibility to the date of birth. Arceo died in 1580.

All the authors who have studied him say that he studied medicine at the University of Alcalá de Henares and in Guadalupe. The author himself says:

*"In the year 1516 in Guadalupe, in my presence, an event occurred as follows: ..."*³⁶.

This fact means that we can be sure he was already a doctor in 1516, so he must have started his university course very late, in 1513. This has not been verified, because the first document from the University of Alcalá, which is available, is the "Libro de registro de actos, grados y provisiones"³⁷, which dates from 1523, whereas the first book of matriculations is from 1548³⁸. Nor does he feature as a member of the college in the works of Gutiérrez Torrecilla [1995]. What is not in doubt is his academic status: he was a doctor of medicine, as his work indicates.

He practised medicine in Llerena, where he was called to surrounding towns to attend to the sick. There he had as a guest the honorary Biblical scholar Arias Montano, a man from his home town:

*"I agreed willingly to this request... especially, because of my great affection for the messenger [Arceo], who offered me... his home... and promised to teach me the art of surgery that he practised..."*³⁹.

Six years before he died he published, in Antwerp (Plantin, 1574), the work *De Recta curandorum vulnervm ratione, et alii eius artis praeceptis libri II... e Iusdem de febrium curandorum rationes*, which was re-edited in Latin in Amsterdam in 1658: *De Recta curandorum vulnervm ratione, et alii eius artis praeceptis libri II... e Iusdem de febrium curandorum rationes*, Amstelodami, Ex officina Petri Van de Berge.

The publication by Plantin was no accident, as Arceo was to edit his work on the insistence of Arias Montano, and it was to coincide with the stay of the latter in Antwerp, co-ordinating the publication of the Bible Regia, or Plantin Polyglot.

³⁶ "Res Guadalupae me praesente accidit anno a christo nato millesimo quingentesimo decimo sexto. Ea huiusmundi es" Arcaeo, *op. cit.*, 109.

³⁷ Alonso Muñoyerro, L. *La facultad de Medicina en la Universidad de Alcalá de Henares*. (Madrid: C.S.I.C., 1945), 213.

³⁸ *Ibid.*, 289.

³⁹ Oyola Fabián and Cobos Bueno, *op. cit.*, 110.

The importance of this work becomes clear if one considers its rapid dissemination across Europe. An edition in English published in London is dated 1588: A most excellent and compediouvs method of curing woundes in the head, and in other partes of the body, with other precepts of the fame Arte, practised and written by that famous man FRANCISCVS ARCEVS, doctor in Phisicke & Chirurgery: and translated into English by Iohn Read, Chirurgion... Imprinted at London by Thomas East, for Thomas Cadaman. log.

It was also published in German in 1600, 1674 and 1717. In 1634 it appeared in French, in Paris, and in 1667 the first edition was published in Dutch in Leeuwarden (*Kortbondige, ende rechte middel, en kunst; om allerhande zooten van wonden op de kortste ende zeekerste manier te geneezen... in't Latijn bescheereven... Met aanteekeni . ngen op een yeder hooftdeel veryijkt ende overgezet door Jacobus Geusius...* Leeuwarden, Yvo Takes Wielsma), and almost simultaneously in Roermond. These Dutch editions were so successful that a reprinting was issued the following year. A re-edition of the work in Latin in Amsterdam in 1659 is also worthy of note.

The work is in two parts; in the first, we mainly find surgical topics and in the second medical problems⁴⁰. However, the author divided the first part into two books: in the first, consisting of seven chapters, six of these are devoted to the effects of cranial surgery and the final one to wounds of the face. The second book consists of two chapters: the first eight describe certain surgical procedures on the chest, abdomen and limbs, and various types of ulcer, while the remaining four deal with the so-called “French disease” (syphilis). He devotes an unnumbered chapter – to some authors one of the most interesting of all – to the study and treatment of children who are born lame. The two books mentioned were followed by three examples taken from professional practice, preceded by a short text written by Benito Arias Montano. The second part, also preceded by a text by Arias Montano, consists of a substantial “Antidotario” – or list of pharmacological resources – and ends with eight chapters on febrile processes.

This work can be considered as a collection of medical histories, corresponding to his own professional practice, brilliantly displaying a style typical of the Renaissance medical “observatio”. It is not an academic text, but it

⁴⁰ Sánchez G.-Mora, Arturo; Revuelta Ramírez, Juan ‘Historia del Monasterio de Guadalupe y de su Escuela de Medicina’ (Trabajos de la Cátedra de Historia Crítica de la Medicina, 1934), III, 213-234; Riera, J. ‘La obra de Francisco Arceo’, *Cuadernos de Historia de la Medicina*, 3 (1964), 89-98; Moulin, Daniel de *A history of surgery, with emphasis on the Netherlands*, (Dordrecht, Boston and Lancaster: Martinus Nijhoff, 1988).

is the product and testimony of his long experience in the practice of surgery, which makes it special⁴¹. Francisco Arceo almost always names each of the patients that he treats, “his accounts are clear, objective and precise: in them, he only tells us what the doctor has been able to observe”⁴². In addition to the patient’s name, he gives the place where he or she was treated, the injuries suffered, the length of the surgical or medical procedure and, finally, the result obtained after therapeutic intervention. It is an almost universal opinion of the authors who have studied the work of Arceo that the first part of this work is the most important and the most original.

TREATMENT OF CLUBFOOT IN A CHILD BORN LAME

As mentioned above, Arceo devoted an unnumbered section⁴³ to the case of a child born with a deformity that we would nowadays call clubfoot.

The author tells us how it frequently occurs that a child is born with one or both feet twisted, curved or deformed, in such a way that they very easily fall over. He says:

*“It sometimes happens that a child is born with one or both feet twisted, curved or flat, so that the child can hardly walk properly. So I want to describe a method that I have used to treat many very lame people, one of whom was a neighbour in Llerena who was difficult to treat, yet who finally regained his health by way of the method that I shall explain”*⁴⁴.

It begins with a preparation:

“First, the child must follow a strictly controlled diet and bathe his feet gently by hand for thirty days using the following concoction:

R/ *One pound of mallow root; fenugreek seed and linseed, four ounces of each; one bunch of chamomile flowers, and another of melilot; the head and*

⁴¹ Granjel, L. S. *Cirugía Española del Renacimiento* (Salamanca: Ediciones del Seminario de Historia de la Medicina Española, 1986) 25.

⁴² “sus relatos son claros, objetivos y precisos; solamente se nos dice en ellos lo que el médico ha podido observar” Riera, *op. cit.*, 93.

⁴³ Arcae, *op. cit.*, 167-172.

⁴⁴ “Saepe accidit vt infans nascatur aut altero aut vtroque pede distorto aut incuruo aut repando ita vt aegre admodu[m] possit incedere ea[ue] de causa hoc loco volui methodum tradere qua plurimos valde claudos liberaui, inter quos exstitit vnus curatu difficillimus Llerenae incola sed tame[n] dice[n]da industria tandem sanitati fuit restitutus” Arcae, F. *De recta curandorum vulnerum ratione et aliis eius artis praeceptis libri II ... Eiusdem De febrium curandarum ratione* (Antverpiae, Ex officina Chistophori Plantini, 1574), 167. Available from: <https://books.google.es/books?id=UGsnioFu2GIC> [consulted 07/01/2016].

*legs of a wether with its fleece and hide, slightly crushed. Boil all in sufficient water until the bones fall apart*⁴⁵.

This mixture is taken from Giovanni da Vigo. This author writes, in Book eight, Chapter viii, “of the medicines that ease any hardening of the nerves and hard abscesses and poorly restored fractures of the bones and joints”:

*“The softening bath for any hardness of the above materials is composed as follows: Take the crushed head of a ram and its legs and some roots of marshmallow, two pounds of each; chamomile: king’s clover [or melilot] and dill, two handfuls of each; fenugreek and linseed, half a pound of each. Boil all together in sufficient water until the meat falls away from the bones, and afterwards bathe and wash the hardened limb with this broth...”*⁴⁶.

Arceo continued:

“After doing this for thirty days, the helper sits down and places the child on his knees, with his hands and knees tied or holding his hands; next, the surgeon acts by dislocating the lame foot with all his strength and attempting to place it in its correct position and at the desired aspect, which must be done quickly, both in the preparation beforehand and because of the tender age of the child himself. Once this procedure is done, the entire joint is immediately covered in a piece of fine linen, previously steeped in warm myrtle oil and tautly, to remove any wrinkles, so that the tie does not cause any pain; he then place upon it bandages impregnated with the following liniment:

R/ *The whites of three eggs, oil from green olives and myrtle oil, an ounce and a half of each; wheat flour and barley, two drachms of each; an ounce and a half of ground Armenian bole; three drachms of snake’s blood; an ounce and*

⁴⁵ “Imprimis ergo vtatur puer debita victus institutione lauenturque pedes per triginta dies blanda manu cu[m] subiuncta decoctione: R/ Radicum altheae libram vnā; seminis foeni graeci, seminis lini ana vnc. iiii; florum chamaemeli et meliloti ana man. j; caput et pedes veruecis vna cum lana et cute aliquantulum contusi. Deinde bulliant in aqua sufficienti ad separationem ossium” (Arcaeo, F. *De recta curandorum vulnere ratione et aliis eius artis praeceptis libri II ... Eiusdem De febrium curandarum ratione* (Antverpiae, Ex officina Christophori Plantini, 1574), 168. Available from: <https://books.google.es/books?id=UGsnio-Fu2GIC> [consulted 07/01/2016].

⁴⁶ “Balneum mollificaris vnūquanque duriciem de pronominatis sic fit: R/ caput vnus castrati aliquantulum incisum et pedens eius: radicum alicae, lib. ij. camomille melliliosi aneti ana ij lib. fenugreci integri et seminis lini ana lib. .5. oia bulliant simul cum aqua sufficienti usque ad effluuium a carne separationem deinde remosis ossibus a carne membrum induratum balneetur et sumumigetur et cum residuo rerum lauando membrum fricetur” Vigo, Giovanni. *Practica in Chirurgia* (Rome: E. Guillery and E. Nanni, 1514), fol., clxxxiv. Available from: <https://books.google.es/books?id=qK-AFcLae-8C> [consulted 06/01/2016].

a half of the powder that we will describe imminently, and which it would be best to have prepared for the whole treatment process. Mix all together. The powder consists of the following:

R/ An ounce and a half of Armenian bole, tragacanth and snake's blood, four drachms of each; barley flour and broad bean flour, a drachm and a half of each. This is made into a very fine powder.

These bandages, already moistened in the aforementioned linen, are moistened again with rose water and vinegar, and are stretched tightly over the affected area at a moderate temperature. Then a wooden sole must be placed upon the sole of the foot, carefully measured to match the size of the foot and a little larger than the insole that is to be placed upon it. A band measuring three inches wide must be attached to it, but one must try to pull the foot in the other direction, starting with the inside of the foot with just a few attempts. Again, on the bandages, tied as described previously, three splints must be used which will not bend easily in any part, made of willow, five inches long and about a thumb's width across. When they are stuffed full of the linen, they should be moistened again, like the bandages, with vinegar and water: the first one should be placed on the rear part, so that it can be seen that it has been inserted into the wooden sole; and the other two, from the sides, on which all the ties have to be made, neither too loose or too tightly, in the manner indicated"⁴⁷.

⁴⁷ "His vero per triginta dies confectis, sedeat minister ac recipiat puerum super genua manibus ac cruribus reuinctis aut manibus prehensis. Deinde accedens chirurgus, pedem claudum primum luxet magna vi nitaturque reponere in debitum locum et figuram optatam, quod fiet promptissime tum ob praegressam praeparatione[m], tu[m] praeterea ob ipsius pueri tenerrimam aetatem. Facta repositione mox apponatur linteum tenue oleo myrthino madens calenti super totum articulum absque rugis ne dolore fatiget deligatio; deinde vero desuper ponantur splenia in sequenti linimento intincta et debite expressa:

R/ Trium ouorum albumina; olei omphacini, myrthini ana vnc. j [et] dim.; polliniss triticeae farinae et hordeaceae ana dr. iiij; pulveris statim describendi, quem decet esse praeparatum pro tota curatione, vnc. dim. Misce. Ex his autem constar pulvis:

R/ Boli armenii vnc. j dim; thuris, mastichis, sarcocollae ana dr. ij [et] dim.; myrrhae, aloes ana dr. j [et] dim; tragacanthi, sanguinis draconis ana dr. iiij; farinae hordei fabarum ana dim. Fiat pulvis subtilis.

Haecitaque splenia in dicto linteo madentia madeant iterum in aqua rosacea et aceto atque expressa super particulam extendantur mediocri calore; mox plantae pedis adhibe[n]da est solea lignea, compar quidem ac paulo maior quam culcitra desuper posita. Deliganda est fascia trium digitorum latitudine, quamquam in co[n]trariam partem trahere contendat pede[m], ab interiori parte exorsa paucis admodum circumuolutionibus. Rursum super splenia, dicto modo deligata, adhibendae sunt tres ferulae, quae neutiquam facile flectantur ex salice concinnatae quinque digitorum longitudine, vnus vero pollicis latitudine extantae" Arcaeo, F. De recta curandorum vulnere ratione et aliis eius artis praeceptis libri II ... Eiusdem De febrium curandarum ratione (Antverpiae: Ex officina Chistophori

While on the other foot:

“On the following day the other foot is treated in the same way for seven days, with a period of waiting afterwards without doing anything. After this, one or the other foot must be treated, if either of the feet is lame, as follows:

R/ Two and a half ounces of turpentine; two ounces of myrtle oil; one of rose oil; frankincense and mastic, a drachm and a half of each; myrrh and aloes, two drachms of each; snake’s blood and Armenian bole, half an ounce of each; fine flour and the red powder described previously, an ounce and a half of each. Mix all together, and apply, warm, to the bandages, with the splints and ties, as described”⁴⁸.

Later he continues by indicating the length of treatment and describing an “instrument”. We have transcribed the relevant section here as follows:

“After this, the medication must be repeated every seven days until the twenty-first day from the first week. The treatment must be performed with the utmost care, so that the feet remain completely straight, after constructing the following instrument together with the boots:

Take a piece of sheet iron measuring an inch wide, of the thickness of a silver tremis coin and of the same length as the child’s foot, more or less. This is to be folded over in the shape of a heel and adjusted to fit the shoe, to which two more sheets are sewn on either side of the ankles, six inches wide, and a similar third one in the rear part. Then these three long pieces, which go up the leg itself, fit around the leg at the top, in such a way that the front part is open and the back is closed, keeping the whole apparatus firm. The other two, from both sides of the heel, must be turned towards the other two lateral pieces. Upon this iron ankle must be placed the shoe for the lame foot, which should be made of goatskin on the outside and of sheepskin on the inside, with a double sole, but in such a way that the heel can stay in between the two types of leather and the head of the shoe should reach up to the upper circular part. It should be noted that the shoe should be open at the front and

Plantini, 1574), 168-170. Available from: <https://books.google.es/books?id=UGsnio-Fu2GIC> [consulted 07/01/2016].

⁴⁸ “Altero autem die medebere pedi alteri eadem methodo vsque ad septimum diem subinde praestolatus ne quidquam aliud molitus. Quo transacto sequenti ratione aut alter pes aut ambo, si vtroque claudicauerit, sunt curandi:

R/ Terebinthinae vnc. ij [et] dim.; olei myrthini vnc. ij; rosati vnc. j; thuris, masticis [ana] dr. j [et] dim. myrrhae, aloës, ana dr. ij; sanguinis draconis, boli armeni ana der. j; pollinis et pulueris rubei antea descripti ana vnc. j. Misce et applicetur tepidum in spleniis, cum ferulis et ligaturis, vt dictum est” Arcaeo, *op. cit.*, 170.

where it touches the instep, and it must be attached with an appropriate cord for this purpose⁴⁹.

Francisco de Arceo marks the treatment stages precisely and rigorously. He continues:

*“Therefore, before putting the shoes on the feet, the easing plaster of Giovanni da Vigo is placed all over the joint, so that the inflammation and humours produced within the joint are got rid of and the joint itself is firmer. Once the shoes are on the feet over the plaster, the patient must not remove the shoes for any reason, for up to four days, then on the fourth day the plaster must be cleaned and softened. And if it has disintegrated in the meantime, apply it anew. The patient will now be able to walk in this way, for six months; after this time, once the plaster has been removed, he should not stop wearing the shoes described. Moreover, for a further six months the shoes must be worn day and night, apart from when he is bathing.”*⁵⁰

He ends the therapeutic protocol with a detailed description of how to make the pharmaceutical preparation used.

⁴⁹ “Deinceps vero repetenda est ista medicatio septenis quibusq[ue] diebus vsque ad esimum primum diem a prima septimana curandumque est summopere quem modu[m] pedes recti prorsus maneant sequenti machinamento cum calceis istructo: Capelaminam ferream vnus digiti longitudinis, crassitudinis trientis argentei, longitudinis pedalis ipsius pueri paulo minus. Hanc flectes instar calcaris calciq[ue] adaptabis, cui ex vtroque latere qua malleolli insunt duas alias laminas assues longitudine sex digitorum, tertiam consimilem in parte posteriori. Has deinde tres longas et quae sursum per crus ipsum ascendunt, cinges circulari alia parte summa ita tamen vt parte anteriori aperta sit, posteriori vero clausa ac totum machinamentum sit firmum. Aliae duae ex vtroque latere calcaris dirigendae sunt in duas illas laterales; super hoc calcar ferreum strui debet calceus pro pede claudo, ex pelle hircina exterius et ruina interius, duplice solea, ita tamen vt calcar inter vtramque pellem intersit et ad circularem illam laminam calcei collum attingat. Vnde co[n]stat calceum apertum esse debere parte anteriori et qua pedis pectini insidet ligandum esse ligamento ad eam rem conueniente” Arcaeo, *op. cit.*, 170-171.

⁵⁰ “Ergo antequam calcentur pedes, substituat[ur] emplastrum Ioannis de Vigo co[n]fortatium super vniuersum articulum, quo tumores atque humores intra articulum adhaerentes dissoluantur et ipse articulus firmior reddatur. Facta deinde calceatione super emplastrum, neitquam discalceabitur aeger nisi quarto quoq[ue] die in quo mundari debet emplastrum atque mollificari. Quod si illud interea te[m]poris dissolutum fuerit, denuo admoueat[ur] aliud poteritq[ue] aeger ea ratione iam incedere, donec sex menses transierint quibus etiam transactis emplastroq[ue] tum amoto no[n] proinde relinquendi sunt calcei iam dicti, imo vero per alios sex menses noctu atque diu calceatus degat excepto tempore illo in quo lauari placeat” (Arcaeo, F. *De recta curandorum vuln[er]um ratione et aliis eius artis praeceptis libri II ... Eiusdem De febrium curandarum ratione* (Antverpiae, Ex officina Chistophori Plantini, 1574), 171-172. Available from: <https://books.google.es/books?id=UGsnio-Fu2GIC> [consulted 07/01/2016].

As follows:

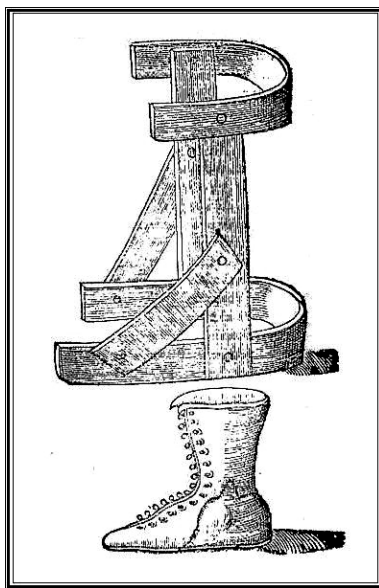
Description of the easing plaster:

R/ Using myrtle oil, rose oil and oil from green olives, take half a pound of each; two pounds of the juice of mallow roots. Of ash leaves and roots, leaves and roots of lesser comfrey, of myrtle and its leaves, and of willow leaves, take two handfuls of each. Boil all together, after mashing the mixture a little, in an equal quantity of red wine and of water until it is reduced to half the amount, with half a drachm each of myrrh and frankincense. Next, strain it and add half a pound of liquefied goat fat, two ounces of turpentine and a drachm of mastic. Boil all together once more until fully cooked.

Finally, strain, and add three ounces of litharge, of gold and of silver; two ounces of very finely ground Armenian bole, and of terra sigillata, and ten drachms of minium. Cook all together on a low heat, stirring continuously with a spatula, and make a paste, by adding wax”⁵¹.

The section is accompanied by a plate showing the “instrument” described (see fig. 4).

Fig. 4: Plate showing the prosthesis invented by Arceo⁵².



⁵¹ “Emplastri confortatiui descriptio: R/ Olei myrthini, rosati, omphacini ana lib. ij; succi radicum altheae lib ij; radices fraxini et foliorum, radices symphyti minoris et foliorum, myrthi et foliorum eius, foliorum salicis ana m. ij. Bulliant omnia prius aliquantulum contusa in vini nigri et aquae pari mensura ad medietatis co[n]sumptionem, cum myrrhae et thuris ana dr. dim. Deinde in colatura addas seui hircini liquifaciti lib. dim, terebinthinae vnc. ij; masticis dr. j. Bulliant iterum simul ad consumptionem decoctionis postremoq[ue] in colatura adde lithargyrii, aurei et argentei ana vnc. iiij; boli armenii triti subtiliter, terrae sigillatae ana vnc. ij; minii dr. x. coquanturq[ue] simul lento igne et agitatione perpetua cum spatha fiatque cerotum, addita cera” Arcaeo, F. *De recta curandorum vulnerum ratione et aliis eius artis praeceptis libri II ... Eiusdem De febrium curandarum ratione* (Antverpiae, Ex officina Chistophori Plantini, 1574), 172. Available from: <https://books.google.es/books?id=UGsnioFu2GIC> [consulted 07/01/2016].

⁵² Taken from Arcaeo, F. *De recta curandorum vulnerum ratione et aliis eius artis praeceptis libri II ... Eiusdem De febrium curandarum ratione* (Antverpiae, Ex officina Chistophori Plantini, 1574). Available from: <https://books.google.es/books?id=UGsnioFu2GIC> [consulted 07/01/2016].

PLAGIARISM BY BARTOLOMÉ HIDALGO DE AGÜERO

Bartolomé Hidalgo de Agüero was born in 1531 in Seville, where, in addition to studying medicine he practised it as a profession, largely as a surgeon at the Hospital del Cardenal. He died in the city in 1597. Seven years after his death, in 1604, his son-in-law, the Sevillian doctor Francisco Ximenez Guillen, published his work *Thesoro de la Verdadera Cirugia y vía Particular contra la Comun*, including *Avisos de particulares de syrurgia contra la comun opinion*, a sheet printed in two column, with no date or place of publication, although it is known that this occurred in Seville in 1584.

In his work, *Thesoro de la Verdadera Cirugia y vía Particular contra la Comun*, section one, chapter 76, “On the twisted foot, or clubfoot from birth”, Hidalgo de Agüero deals with the problem of this deformity. In this section we found that its author clearly plagiarises Arceo’s treatment for clubfoot. To demonstrate this, one only has to transcribe some of the paragraphs from the text of Arceo⁵³ and that of Hidalgo de Agüero⁵⁴ and compare them, as can be seen in Tables 1 and 2.

Table 1. Chart to compare a fragment of the work of Arceo and of Hidalgo de Agüero.

| Arceo | Hidalgo De Agüero |
|---|---|
| It sometimes happens that a child is born with one or both feet twisted, curved or flat, so that the child can hardly walk properly. So I want to describe a method that I have used to treat many very lame people, of whom one was a neighbour in Llerena who was difficult to treat, yet who finally regained his health by way of the method that I shall explain | It happens often that a child is born with one foot, or both, twisted, or with clubfoot, such that he can barely and only with difficulty walk on them, because they are twisted, so it seemed to me it would be a good thing to devise a method to treat them, not only because of the great clumsiness in walking, but also because of the unsightliness that it causes |

⁵³ Arcaeo, F. De recta curandorum vulnerum ratione et aliis eius artis praeceptis libri II ... Eiusdem De febrium curandarum ratione (Antverpiae, Ex officina Chistophori Plantini, 1574), 167-168. Available from: <https://books.google.es/books?id=UGsnioFu2GIC> [consulted 07/01/2016].

⁵⁴ Hidalgo de Agüero, B. *Thesoro de la verdadera Cirugia y vía particular contra la común* (Sevilla: F. Pérez, 1604), fols., 40v-41v. Available from: books.google.es/books?id=7QxQD-gOD.mkC [consulted 10/09/2015].

Table 2. The treatment to be followed: another comparative test illustrating the plagiarism by Bartolomé de Hidalgo Agüero.

| Arceo | Hidalgo De Agüero |
|---|--|
| <p><i>First, the child must follow a strictly controlled diet and bathe his feet for thirty days gently by hand with the following concoction:</i></p> <p><i>R/ One pound of mallow root; fenugreek seed and linseed, four ounces of each; one bunch of chamomile flowers, and another of melilot; the head and legs of a wether with its fleece and hide, slightly crushed. Boil all in sufficient water until the bones fall apart.</i></p> | <p><i>and to this end, this embrocation or wash should be used for twenty or thirty days:</i></p> <p><i>R/ One pound of mallow roots, fenugreek seed and linseed, four ounces of each; one handful each of chamomile flowers and melilot flowers; the head and feet of a ram together with its fleece and hide, all somewhat crushed and then cook all in water, until the bones fall apart.</i></p> |

THE DISSEMINATION OF THE METHODS OF ARCEO THROUGH HISTORY

Francisco de Arceo developed his profession at a very favourable time, since the Renaissance facilitated the appreciation of great experts and universities that were open to new methods. He was recognised as a prestigious surgeon throughout Europe among his contemporaries, as was noted by Juanini in the seventeenth century. In this regard, it is interesting to note a remedy that he invented, known as Bálsamo de Arceo, or Arceo’s balm, the fame of which as an excellent antiseptic and wound healer, gradually spread across Europe. Indeed, many patients from various places in Europe visited Llerena to restore their health using Arceo’s methods⁵⁵. There is an evidence that it was used very successfully by the physician to Queen Elizabeth I of England, Roderigo Lopes (Portugal c. 1525 Tyburn 1594), to treat serious gunshot wounds⁵⁶. Although some authors did not lend much support to this remedy⁵⁷, the fact is that further studies have confirmed that it was included until the twentieth century in various pharmacopoeia and other documents

⁵⁵ Oyola Fabián and Cobos Bueno, *op. cit.*
⁵⁶ Kottek S. ‘Doctor Roderigo Lopes - Some Items of Medico-Historical Interest’, *Medical History*, 17 (1973), 400-405.
⁵⁷ Griffiths, Adrian ‘Dr. Rodrigo Lopez’, *Saint Bartholomew’s Hospital Journal*, 68 (1964), 449-452.

such as the Spanish Military Pharmacy Formulary of 1975⁵⁸. Although it has now fallen into disuse, the survival of this remedy over such a long time is testimony to its therapeutic efficacy, which would certainly merit ethnopharmacological validation prior to potential application in the pharmaceutical industry⁵⁹. Clearly, the effectiveness of the methods and remedies used in the treatment of diseases is critical in the transmission of therapeutic practices, although historical context and the evolution of scientific knowledge must be taken into account. In the case of Arceo's balm, its use spread at a time when economic development was driven by the spice trade, and the existence of organisations that promoted the spread of plant-based remedies and medicines, such as the Jewish families that had a monopoly on raw materials arriving from the Americas; a time when there was also a significant scientific exchange in medicinal plants⁶⁰.

The efficacy of Arceo's methods can also be seen in the description of two cases of aphasia and its treatment, recently published in the international literature⁶¹. Unlike the use of the balm, the surgery involved in treating these episodes of speech loss as a result of brain injury did not last over time.

Another critical factor for professional dissemination to be successful would be the existence of scientific debates about these tools or resources to deal with the illness. So, we can see that Arceo, like Paré, would not, as a surgeon, have been motivated to discuss the signs, symptoms and causes of an illness or disease. In the cited example on aphasia, without any debate on the causes and subject to paradigm shifts⁶², the conceptual evolution of this

⁵⁸ *Formulario español de farmacia militar*, 7ª ed. Vol II (reimpresión), (Madrid, 1975) 1433; Cobos Bueno, J. M., Oyola Fabián, A. and García Ávila, J.F. 'El Bálsamo de Francisco Arceo de Fregenal', *Llull*, 33, 72 (2010), 241-268.

⁵⁹ Heinrich, M., Kufer, J., Leonti, M., Pardo-de-Santayana, M. 'Ethnobotany and ethnopharmacology – Interdisciplinary links with the historical sciences *Journal of Ethnopharmacology*', 107 (2006), 157-160; Pardo de Santayana, M., Quave C.L., Soukand R., Pieroni P. *Medical Ethnobotany and Ethnopharmacology of Europe*, in Michael Heinrich, Anna K. Jäger (eds.), *Ethnopharmacology* (Wiley, 2015), 343-355.

⁶⁰ Barona, J. L. 'Clusius' exchange of botanical information with Spanish scholars', in Egmond, F.; Hoftizer, P.; Visser, R. (eds.), *Carolus Clusius, Towards a Cultural History of a Renaissance Naturalist* (Amsterdam, Koninklijke Nederlandse Academie van Wetenschappen, 2007), 99-116; Pardo Tomás, J. *Two glimpses of America from a distance: Carolus Clusius and Nicolás Monardes*, in Egmond, F., Hoftizer, P.; Visser, R. (eds.), *Carolus Clusius, Towards a Cultural History of a Renaissance Naturalist* (Amsterdam, Koninklijke Nederlandse Academie van Wetenschappen, 2007), 173-194; Pardo-Tomás, J. *East Indies, West Indies: Garcia de Orta and the Spanish Treatises on Exotic Materia Medica*, in Palmira Fontes da Costa (ed.), *Medicine, Trade and Empire: Garcia de Orta's Colloquies on the Simples and Drugs of India in Context* (Farnham: Ashgate, 2015), 195-212.

⁶¹ Muñoz-Sanz, García-Ávila and Vallejo, *op. cit.*

⁶² *Ibid.*

speech disorder would prevent both the dissemination and any subsequent medical historiographical analysis.

We should also consider the existing disputes between those who disseminated their knowledge in Spanish and those who did so in Latin, and bear in mind that Arceo was a surgeon, as was Paré although he had no university education, and Hidalgo was a doctor. The attitude of preserving elitist knowledge as against a concern to promote the training of professionals who did not understand Latin, can also be observed in the case of other surgeons, such as Dionisio Daza Chacón⁶³. Consider, too, that the work *De recta curandorum...* is written in exquisite Latin that would seem, rather, to have been written by someone of exceptional stature; this fact has led to the hypothesis that it was written by Arceo's great friend, the humanist Arias Montano⁶⁴. However, in comparing the spread of the practices and writings of these authors, we find that independence exists between the dissemination of knowledge and professional status.

Nevertheless, the method of using herbal medicine, and using splints and boots designed by Arceo, made an important contribution to the correction of clubfoot. It was a very practical innovation, which an eclectic professional such as Hidalgo de Agüero – a doctor who performed surgical operations – claimed as his own, plagiarised and disseminated knowledge of it throughout Spain. However, both the work of Arceo and that of his plagiarist took place under historical, economic and political circumstances from which there was no follow-up. In fact, Hidalgo de Agüero's plagiarism suggests a narcissistic personality, a desire to play the leading role, and individualism. Moreover, Hidalgo does not generate any discussion about the deformity or any methods for correcting clubfoot; he simply copies. This context, and the lack of any continuing education based on the study by Spanish surgeons meant that Arceo's invention was to remain forgotten in his own country. So, why did it not find success in Europe where the surgeon enjoyed prestige and renown? Conversely, why did the works and methods used by Paré gain acceptance? To answer this question we can look at the way of life, beliefs, personality and capacity for leadership of them both, but particularly at their attitude towards a professional discussion aimed at improving practice. On the one hand, the French surgeon has been described as a man with a big

⁶³ Conde Parrado, Pedro. 'Por el orden de Celso: aspectos de la influencia del *De medicina* en la cirugía europea del Renacimiento', *Dynamis* [online], 28 (2008), 217-241. Available from: <http://scielo.isciii.es/scielo.php?script=sci_arttext&pid=S0211-95362008000100010&lng=es&nrm=iso> [consulted 10/10/2015].

⁶⁴ Oyola Fabián and Cobos Bueno, *op. cit.*

personality, with a very independent mind, and with political skills. A lot of information exists about the life of Ambroise Paré, which shows that he argued with much common sense and simplicity, that he spoke in favour of new methods, and criticised those with whom he did not agree⁶⁵. Certainly, many of Paré's characteristics are very relevant to our discussion: pragmatism and a talent for debate, together with leadership concerning his practice. So, at this point, what do we know about the personality of Francisco de Arceo, also curiously known as the Ambroise Paré of Spain? Well, until now, merely deductions based on his works and the prologue written by his good friend Benito Arias Montano. However, he learned medicine in Guadalupe and practised it in Llerena as a doctor to the Inquisition and the Council⁶⁶. In 2009, Oyola suggested that he was a Jewish convert, in addition to other hypotheses regarding his origin as a native of Fregenal rather than of Llerena, and whether Arcos was his actual surname. Fortunately, the next publication of documents obtained by Rafael Caso, chronicler of Fregenal de la Sierra, was to confirm these hypotheses (pers. comm. A. Oyola Fabian). It is obvious that in sixteenth century Spain, a Jewish convert would be concerned above all to play a discreet role in society and to erase any traces of his past because of the need for approval under the statutes of purity of blood and the work of the Inquisition against false converts, or those suspected of being one. All this was to make for a characteristic personality incompatible with that of a charismatic leader. It is very unlikely that Arceo's knowledge and methods would have been passed on from a School where his followers would defend his practices and ideas; for that, it was obviously not enough to have prestige and social recognition as a scientist. Moreover, the possibility for a convert in sixteenth century Spain to form a scientific school is also unlikely, since the sciences were very much subject to the control exerted by the Church and the Inquisition, which, for example, issued an index of banned books in which all the latest new ideas, especially foreign ideas, were listed. In Europe, perhaps, particularly in the more "progressive", more bourgeois environments that were less tied to obedience to the Vatican or openly Calvinist, Lutheran or Anglican (and not without problems). We can therefore rule out the idea that Arceo had a role as a scientific leader and developed a school. All the indications are that his Avicenna-like Galenism was extremely

⁶⁵ Kneys, G. (ed.) *The Apologie and Treatise of Ambroise Paré* (London: Falcon Educational Books, 1951); Drucker, Charles B. 'Ambroise Paré and the Birth of the Gentle Art of Surgery', *The Yale Journal of Biology and Medicine*, 81, 4 (2008), 199–202; Hernigou, Philippe. 'Ambroise Paré II: Paré's Contributions to Amputation and Ligature', *International Orthopaedics*, 37, 4 (2013), 769–772.

⁶⁶ Oyola Fabián and Cobos Bueno, *op. cit.* and Cobos and Vallejo, *op. cit.*

effective, which makes the fact that his balm continued to be used until the twentieth century understandable, although the change to a hegemonic biomedical model was a decisive factor in its eventual abandonment. Moreover, the scientific literature confirms the importance of the medical heritage of plant and animal-based remedies in Europe⁶⁷, and until the Enlightenment it was essential for surgeons to make their own ointments⁶⁸. However, these factors do not apply in the case of the passing on of his method for treating clubfoot and it could have been hampered by both the scientific context of the time and the surgeon's personality.

FINAL CONSIDERATIONS

The slow, gradual accumulation of scientific knowledge, its usefulness and effectiveness, paradigm shifts, and the introduction of any dominant models or professional status could be factors to explain the survival, loss or disuse of knowledge, its diffusion and breadth in a later historiographical study; however, the fact that Arceo himself has not had the recognition he deserves can be explained by Arceo's mentality, as a result of his family origins. Nevertheless, Francisco de Arceo's creativity and pragmatism are wonderful. Only to think of how the way of treating clubfoot, even up to a decade ago, was to correct the deformities using surgery, therefore the conservative treatments of Arceo should be seen in due perspective⁶⁹. Undoubtedly, he is one of those figures in the history of science who, during the Renaissance, anticipated modernity.

There is no doubt that the popularisation of science is vital for both the scientist and the public in general in any period in history, and therefore we consider it as another mission of the historian of science. In this respect, the figure and work of Arceo should continue to be examined in greater depth and promoted, given the stature of the man. For example, his pharmacological knowledge could lead to great surprises given the existing scientific evidence in herbal medicine.

⁶⁷ Vallejo, José Ramón and González, José Antonio 'Los anfibios en la medicina popular española, la farmacopea de Plinio y el Dioscórides' *Hist. cienc. saude-Manguinhos*, 22, 4 (2015), 1283-1319. Available from: <http://www.scielo.br/scielo.php?script=sci.arttext&pid=S0104-59702015000401283&lng=en&nrm=iso> and Pardo de Santayana *et al.*, *op. cit.*

⁶⁸ Moulin, Daniel de *A history of surgery, with emphasis on the Netherlands*, (Dordrecht, Boston and Lancaster: Martinus Nijhoff, 1988), 184.

⁶⁹ Dobbs, M.B. and Gurnet C.A. 'Update on Clubfoot: etiology and treatment', *Clin Orthop Relat Res*, 467, 5 (2009), 1146-1153; Horn, B.D. and Davidson, R.S. 'Current treatment of clubfoot in infancy and childhood', *Foot and Ankle Clin*, 15, 2 (2010), 235-43.

ACKNOWLEDGEMENTS

We would like to express our thanks to the Sociedad Extremeña de Historia and to Felipe Lorenzana, Andrés Oyola Fabián, Luis Garraín Villa, Antonio Cestero and Ángel Bernal for their contributions to the dissemination of Arceo's methods. We would also like to thank Rachel Fell for her English technical support.

REFERENCES

1. Adams, Francis. *The Genuine Works of Hippocrates Translated from the Greek*, (Sydenham Society, 1849), 1.
2. Alonso Muñozerro, L. *La facultad de Medicina en la Universidad de Alcalá de Henares*. (Madrid: C.S.I.C., 1945).
3. Álvarez, C., et al. 'Review of Current Methods Used in the Treatment of Clubfoot at Initial Presentation and at Recurrence', *Journal of Surgical Orthopaedic Advances*, (2008) 17 (2), 107-114.
4. Andry, N. *L'orthopédie ou l'art de prévenir et de corriger dans les enfants, les difformités du corps* (Paris: Rue Saint Jacques, 1741-1743) Vol. 1 available from <https://books.google.es/books?id=oKMUAAAQAAJ&printsec=frontcover&hl=es#v=onepage&q&f=false>, vol. 2 available from <https://books.google.es/books?id=cqMUAAAQAAJ&printsec=frontcover&hl=es#v=onepage&q&f=false> [consulted 11/11/2015].
5. Arceo, F. *De recta curandorum vulnere ratione et aliis eius artis praeceptis libri II ... Eiusdem De febrium curandarum ratione* (Antwerp: Plantin, 1574).
6. Barona, J. L. 'Clusius' exchange of botanical information with Spanish scholars'. In: Egmond, F.; Hoftizer, P.; Visser, R. (eds.), *Carolus Clusius, Towards a Cultural History of a Renaissance Naturalist* (Amsterdam, Koninklijke Nederlandse Academie van Wetenschappen, 2007) 99-116.
7. Bohm, M. *Embryologic origin of clubfoot*. (*J Bone Joint Surg*, 1929) 11, 229-59.
8. Carroll, Norris. 'Clubfoot Trough the Ages', in Raffensperger, John G. (ed.), *Children's Surgery: A Worldwide History* (North Carolina: McFarland, 2012) 160-166.
9. Cobos Bueno, J. M., Oyola Fabián, A. and García Ávila, J.F. *El Bálsamo de Francisco Arceo de Fregenal*. (Llull, 2010) 33 (72), 241-268.
10. Cobos, J.M. and Vallejo, J.R. *Francisco Arceo, médico del Santo Oficio de la Inquisición de Llerena*. In: Lorenzana de la Puente, F. and Mateos Ascacibar, F.J. (coords.) *XV Jornadas de Historia de Llerena, 'Inquisición'*. Llerena, 24 and 25 October 2014 [www.sociedadextremeñadehistoria.es], (Sociedad Extremeña de Historia, 2014) 299-310.
11. Conde Parrado, Pedro. *Por el orden de Celso: aspectos de la influencia del De medicina en la cirugía europea del Renacimiento*. *Dynamis* [online] 2008, vol.28 [cited 2015-12-31], 217-241. Available from: <<http://scielo.isciii.es/scielo.php?script=sci.arttext&pid=S0211-95362008000100010&lng=es&nrm=iso>>.
12. Dimeglio, A. and Canavese, F. 'The Clubfoot: An Overview of Current Procedures', *Rev Ortop Traumatol*, (2006) 50, 156-63.

13. Dobbs, M.B. and Gurnet C.A. 'Update on Clubfoot: etiology and treatment', *Clin Orthop Relat Res.*, (2009) 467(5), 1146–1153.
14. Fixsen, J.A. 'Children's orthopaedic Surgery' in: Leslie Klenerman (ed.), *The evolution of orthopaedic surgery*, 149-158 (London: Royal Society of Medicine Press, 2002).
15. Gamboa Márquez, Alejandro and Garzón-Alvarado, Diego Alexander, 'Factores mecánicos en enfermedades osteocondrales', *Rev Cubana Invest Bioméd.*, (2011) 30 (1), 171-192.
16. Granjel, L. S. *Cirugía Española del Renacimiento* (Salamanca: Ediciones del Seminario de Historia de la Medicina Española, 1986).
17. Griffiths, Adrian, 'Dr. Rodrigo Lopez', *Saint Bartholomew's Hospital Journal*, (1964) 68, 449-452.
18. Gruber, H. et al., 'The different growth zones of the fetal foot', *Ann Anat.*, (2001) 183 (3), 267-273.
19. Gutiérrez Torrecilla, L.M. *Los colegiales del Colegio Mayor de San Ildefonso de la Universidad de Alcalá: vida académica y promoción profesional (1508–1777)* (Alcalá de Henares: Servicio de Publicaciones Universidad de Alcalá de Henares, 1995) (Doctoral thesis, microfiches).
20. Hefti, F. *Pediatric Orthopedics in Practice* (Berlin Heidelberg, Springer-Verlag, 2015).
21. Heinrich, M., Kufer, J., Leonti, M., Pardo-de-Santayana, M., 'Ethnobotany and ethnopharmacology – Interdisciplinary links with the historical sciences', *Journal of Ethnopharmacology*, (2006) 107: 157-160.
22. Hernigou, P. 'Authorities and foundation of the orthopaedic school in Germany in the 19th century: part II: Richard von Volkmann, Julius Wolff, Albert Hoffa, Friedrich Trendelenburg and other German authors', *International Orthopaedics (SICOT)*, (2016) 40 (4), 843-53.
23. Hidalgo de Agüero, B. *Thesoro de la verdadera Cirugia y vía particular contra la común* (Sevilla: F. Pérez, 1604). Available from: books.google.es/books?id=7Qx-QDgOD_mkC [consulted 10/09/2015].
24. Hjelmstedt, A. and Sahlstedt, B. 'Talar deformity in congenital clubfeet. An anatomical and functional study with special reference to the ankle joint mobility', *Acta Orthop Scand*, (1974) 45 (4), 628-640.
25. Horn, B.D. and Davidson, 'Current treatment of clubfoot in infancy and childhood', *Foot and Ankle Clin*, (2010) 15(2): 235-43.
26. Juanini, J.B. Señor, el Doctor D. Juan bautista Juanini, cirujano de Camara, que fue de S.A. el Señor D. Juan de Austria... (Madrid, 1690?) Available from: books.google.es/books?id=-13q-6Pz7h4C [consulted 01/04/2014].
27. Kneys, G. (ed.) *The Apologie and Treatise of Ambrose Paré* (London: Falcon Educational Books, 1951).
28. Kottek S. 'Doctor Roderigo Lopes - Some Items of Medico-Historical Interest', *Medical History*, (1973) 17, 400-405.

29. Malgaigne, J.-F. *Oeuvres complètes d'Ambroise Paré* (Paris: Chez J.-B. Baillière, 1840-1841) Vol. I available from: books.google.com/books?vid=BCUL1092655840. Volume II available from: books.google.es/books?id=WOESAAAAYAAJ. Vol. III available from: <https://books.google.es/books?id=XhxAAAAAcAAJ&dq=%C5%92uvres+compl%C3%A8tes+d%27Ambroise+Par%C3%A9,+Volumen+3&hl=es&source=gbp.navlinks.s> [consulted 11/10/2015].
30. Mehlman, C.T., Araghi, A. and Roy, D.R., 'Hyphenated history: the Hueter-Volkman law', *Am J Orthop* (Belle Mead NJ), (1997) 26, 798-800.
31. Montero Cartelle, E., 'Benito Arias Montano y Francisco Arceo: la redacción del De recta curandorum vulnerum ratione', *Asclepio. Revista de Historia de la Medicina y de la Ciencia*, (2012) LXIV, 2, July-December, 417-434.
32. Mostofi, S.B. (Ed.) *Who's Who in Orthopedics* (Springer Science & Business Media, 2005).
33. Moulin, Daniel de *A history of surgery, with emphasis on the Netherlands*, (Dordrecht, Boston and Lancaster: Martinus Nijhoff, 1988).
34. Muñoz-Sanz, A., García-Ávila, J.F., Vallejo, J.R., 'Cases of aphasia in a work on medicine from the 16th century', *Acta Medico-Historica Adriatica*, (2014) 12 (2), 371-384.
35. Nordin, S. et al., 'Controversy in congenital clubfoot: Literature Review', *Malaysian Journal of Medical Sciences*, (2002) 9 (1), 34-40.
36. Oyola Fabián, A. and Cobos Bueno, J. M. *Método verdadero de curar las heridas y otros preceptos de este arte. Método de curar las fiebres. Francisco Arceo de Fregenal. Prefacio de Benito Arias Montano* (Huelva: Servicio de Publicaciones de la Universidad de Huelva, Bibliotheca Montaniana, 2009).
37. Oyola Fabián, A. *El año de nacimiento de Benito Arias Montano el Mayor IV Jornadas de El Humanismo Extremeño* (Trujillo, Badajoz: 2000) 87-94.
38. Pardo de Santayana, M., Quave C.L., Soukand R., Pieroni P., 'Medical Ethnobotany and Ethnopharmacology of Europe', in Michael Heinrich, Anna K. Jägle (eds.), *Ethnopharmacology*, (Wiley, 2015) 343-355.
39. Pardo Tomás, J. *Two glimpses of America from a distance: Carolus Clusius and Nicolás Monardes* In: Egmond, F., Hoftizer, P.; Visser, R. (eds.), *Carolus Clusius, Towards a Cultural History of a Renaissance Naturalist* (Amsterdam, Koninklijke Nederlandse Academie van Wetenschappen, 2007) 173-194.
40. Pardo-Tomás, J. *East Indies, West Indies: Garcia de Orta and the Spanish Treatises on Exotic Materia Medica* In: *Palmira Fontes da Costa*, ed. *Medicine, Trade and Empire: Garcia de Orta's Colloquies on the Simples and Drugs of India in Context* (Farnham: Ashgate, 2015) 195-212.
41. Paré, Ambroise *Les Oeuvres d'Ambroise Paré. Quatriesme Edition. Paris: Gabriel Buon, Avec privilege du Roy* (1585) Available from: <http://www2.biusante.paris-descartes.fr/livanc/?cote=01709&do=chapitre> [consulted 28/10/2015].
42. Parker, R.W. and Shattock, S.G., 'The pathology and etiology of congenital congenital club-foot', *Trans Path Soc Lond*, (1984) 35, 423-444.
43. Peltier, L.F. *Orthopedics: a history and iconography* Norman Orthopedic Series No. 3, Norman Surgery Series No. 6. (San Francisco: Norman Publishing, 1993).
44. Riera, J., 'La obra de Francisco Arceo', *Cuadernos de Historia de la Medicina*, (1964) 3, 89-98.

45. Sánchez G.-Mora, Arturo; Revuelta Ramírez, Juan, 'Historia del Monasterio de Guadalupe y de su Escuela de Medicina', *Trabajos de la Cátedra de Historia Crítica de la Medicina*, (1934) III, 213-234.
46. Scarpa, A. *A Memoir on the Congenital Clubfoot of Children and the Mode of Correcting that Deformity* (Edinburgh: Constable, 1818).
47. Strach, E.H. 'Club-foot Trough the Centuries', in Rickham, Peter Paul (ed.), *Historical Aspects of Pediatric Surgery* (Berlin, Heidelberg: Springer-Verlag, 1986) 20, series Progress in Pediatric Surgery, 215-237.
48. Vallejo, José Ramón and Gonzalez, José Antonio, 'Los anfibios en la medicina popular española, la farmacopea de Plinio y el Dioscórides', *Hist. cienc. saude-Manguinhos* [online]. (2015) 22 (4) [cited 2015-12-31], 1283-1319 . Available from: <<http://www.scielo.br/scielo.php?script=sci.arttext&pid=S0104-59702015000401283&lng=en&nrm=iso>>.
49. Vigo, Juan da *Libro o práctica en cirugía del doctor...* Translated by Miguel Juan Pascual (Valencia: 1537) Available from: http://books.google.es/books/about/Libro_o_practica_en_cirugia_del_doctor_J.html?id=w8B-L_ARXIC&redir_esc=y [consulted 17/10/2015].
50. Vincelet, L., 'Ambroise Paré et la religion', *Histoire des sciences médicales*, (1968) 2, 79-93. Available from: <http://www.biusante.parisdescartes.fr/sfhm/hsm/HSMx1968x002x002/HSMx1968x002x002.pdf> [consulted 15/11/2015].
51. Walsh, James J. *The Century of Columbus* (New York: Catholic Summer School Press, 1914).
52. Willy, C. et al., 'Richard von Volkmann: surgeon and Renaissance man', *Clinical Orthopaedics and Related Research*, (2008) 466 (2), 500-6.

SAŽETAK

Ispravljanje prirođenog uvrnutog stopala (eng. clubfoot) nije uobičajena tema istraživanja, posebice uzme li se u obzir da se do razdoblja renesanse samo nekoliko autora bavilo tim naslijeđenim poremećajem. S jedne je strane Ambroise Paré, čiji su doprinosi traumatologiji i ortopediji zapanjujući, a s druge Francisco Arceo de Fregenal, poznat i kao španjolski Ambroise Paré. Obojica su razvili metodu liječenja ovog stanja i specijalne ortopedске cipele. Zašto je, dakle, u španjolskoj literaturi francuski kirurg od početka smatran pionikom koji je razvio ortopedске cipele, a ne Arceo? Zašto se rad Španjolca nije duboko proučavao, kao što zasluđuje? Ta su nas pitanja potaknula na pisanje rada u kojem smo kao glavni cilj odlučili istaknuti Arceov doprinos u ortopediji. Danas postoje konkretni argumenti i radovi koji su doveli do zajedničkog zaključka znanstvenika, koji se bave ovom temom, da je španjolski kirurg bio židovski obraćenik. Društveni, ekonomski i politički uvjeti u Europi u to doba mogu nam dati neke predodžbe o teškoćama prilikom židovske konverzije u 16. stoljeću pa je za znanstvenika, očito, bilo teško imati sljedbenike koji bi branili njegove metode i tehničke zamisli. Ipak, vjerujemo da je Francisco Arceo de Fregenal zaslužio više priznanja i da njegov rad treba nastaviti proučavati.

Ključne riječi: povijest ortopedije, prirođeno uvrnuto stopalo (clubfoot), renesansa, Ambroise Paré, Francisco Arceo de Fregenal